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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/696,693	10/29/2003	Michael Shur	SETI-0007	5258

23550 7590 04/23/2008

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EXAMINER	
DICKEY, THOMAS L	

ART UNIT	PAPER NUMBER
2826	

NOTIFICATION DATE	DELIVERY MODE
04/23/2008	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

PTOCommunications@hwdpatents.com

Office Action Summary	Application No.	Applicant(s)	
	10/696,693	SHUR ET AL.	
	Examiner	Art Unit	
	Thomas L. Dickey	2826	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *05 February 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-3,7,8,10,11,13-17,20,21,23-26,28 and 29* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-3,7,8,10,11,13-17,20,21,24-26,28 and 29* is/are rejected.

7)☒ Claim(s) *23* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *29 October 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. The requirement for election of species mailed 03/17/08 is withdrawn. That action is vacated and this will replace it, restarting the time period for response.

Drawings

2. The formal drawings filed on 01/02/2008 are acceptable.

3. The drawings were objected to in the action mailed 09/28/07. At that time it was suggested that:

> It may be that "array of rectifying contacts" (as this term is used by the claims) simply means two or more rectifying contacts in proximity to each other, as suggested by existing figures 7 and 8 and language in the specification (paragraphs 0033-0035 - note that these paragraphs contain the only discussion of "arrays" found in the specification) discussing the claimed "array of heterodimensional diodes." If such be the case, the claimed "array of rectifying contacts" is adequately represented by figures 7 and 8.

On 2/5/08, Applicants replied:

> Similarly, FIG. 8 shows multiple rectifying contacts included in an array of heterodimensional diodes. To this extent, Applicants respectfully submit that a person having ordinary skill in the art would understand the claim term "array of rectifying contacts" without the aid of an additional figure.

Applicants appear to agree that there is no more complexity to the claimed "array of rectifying contacts" (as this term is used by the claims) than the two or more rectifying contacts in proximity to each other shown in figures 7 and 8. This being the case, there is no need for an additional figure illustrating the claimed "array of rectifying contacts."

It was further suggested that:

> It may be (as the Examiner reasons below) that "field effect transistor array" (as this term is used by the claims) simply means placing two or more field effect channels in proximity to each other, as shown in figure 5. Such a construction of the term "field effect transistor array" is suggested by existing figures 7 and 8 and language in the specification (paragraphs 0033-0035 - note, again, that these paragraphs contain the only discussion of "arrays" found in the specification) discussing the claimed "array of heterodimensional diodes." If such be the case, the claimed "field effect transistor array" is adequately represented by figure 5.

On 2/5/08, Applicants replied:

> However, Applicants note that FIG. 2 shows an illustrative field effect transistor, and FIGS. 7 and 8 show illustrative arrays of heterodimensional diodes. The application further discusses arrays of various devices, including field effect transistors. Specification, paragraph 0035. To this extent, Applicants respectfully submit that a person having ordinary skill in the art would understand the claim term "field effect transistor array" without the aid of an additional figure.

Applicants appear to agree that there is no more complexity to the claimed "field effect transistor array" (as this term is used by the claims) than the two or more field effect channels in proximity to each other shown in figures 7 and 8. This being the case, there is no need for an additional figure illustrating the claimed "field effect transistor array."

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

A. Claims 1-3, 7, 8, 10, 13-17, 20, 24-26, and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over RYZHIIA ET AL., "Terahertz photomixing in quantum well structures" J. App. Phys. Vol. 91 p. 1875 (2002) in view of SOHN ET AL., "Tunable terahertz generation using femtosecond pulse shaping," Appl. Phys. Lett. Vol. 81 p. 13 (2002). In the examiner's opinion, this/these claim(s) would have been obvious according to one of the rationales expressed in the *Examination Guidelines for Determining Obviousness Under 35 U.S.C. 103 in View of the Supreme Court Decision in KSR International Co. v. Teleflex Inc.*, as published at 72 Federal Register 57526 et seq.[1] (10/10/2007).

The Guidelines explain that an invention that would have been obvious to a person of ordinary skill at the time of the invention is not patentable. The Guidelines point out that, as reiterated by the Supreme Court in KSR, the framework for the objective analysis for determining obviousness under 35 U.S.C. 103 is stated in *Graham v. John Deere Co.* Obviousness is a question of law based on underlying factual inquiries. The factual inquiries enunciated by the Court are as follows:

(1) Determining the scope and content of the prior art;

(2) Ascertaining the differences between the claimed invention and the prior art, and

(3) Resolving the level of ordinary skill in the pertinent art.

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[1] Available at http://www.uspto.gov/web/offices/com/sol/notices/72fr57526.pdf

Examining this last factor first, it is noted that any obviousness rejection should include, either explicitly or implicitly in view of the prior art applied, an indication of the level of ordinary skill. This is an essential finding because (as the Guidelines point out) a finding as to the level of ordinary skill may be used as a partial basis for a resolution of the issue of obviousness. The person of ordinary skill in the art is a hypothetical person who is presumed to have known the relevant art at the time of the invention. Factors that may be considered in determining the level of ordinary skill in the art include:

(1) "Type of problems encountered in the art;"
(2) "prior art solutions to those problems;"
(3) "rapidity with which innovations are made;"
(4) "sophistication of the technology;" and
(5) "educational level of active workers in the field."

In a given case, every factor may not be present, and one or more factors may predominate.

In the present case, Applicant has presented claims to a device classified in Class 257 (Semiconductor Devices). The types of problems encountered in Class 257 typically are highly complex, involving questions of electrodynamics, thermodynamics, crystallography, and quantum mechanics. Prior art solutions to the problems presented in this field demonstrate thinking of the highest order. Many prior art solutions in this field have won Nobel prizes. Past Nobel prizewinners for Class 257 innovations include John

Bardeen, William Schockley, Jack Kilby, Leo Esaki, Nick Basow, Zhores Alferov, Pierre-Gilles de Gennes, and probably a half dozen more this writer has forgotten. Innovations in Class 257 are made with extremely high rapidity (see, e.g. "Moore's Law"). Technology used to make and practice inventions in this field are highly sophisticated. Some "fabs" (as those of skill in the art call the factories for making these devices) now cost in excess of one billion dollars each, and perform literally hundreds of billions of operations per hour. Finally, the educational level of active workers in this field is extremely high – Ph.D.s are common, and a bachelor's degree in engineering is the absolute minimum educational level of workers in this field.

In short, the level of ordinary skill in this field is extremely high. In *KSR*, the Supreme Court cautioned, "A person of ordinary skill is also a person of ordinary creativity." *KSR Int'l Co. v. Teleflex Inc.*, 127 S.Ct. 1727, 1742, 82 USPQ2d 1385, 1397 (2007). Had the Court taken a look at the people who have practiced the semiconductor art in the past and the variety of extraordinarily valuable (from lifestyle-changing, such as high-speed communications and computing, to handy devices such as IPods and cell-phones) and difficult solutions to challenging problems those people have accomplished, the Court might easily have said that in the semiconductor art the person of ordinary skill is a person of extraordinary creativity.

Next, we consider the first and second factual findings required by *Graham*. With regard to claims 1-3, 7, and 24, the scope and content of the prior art includes, in the Ryzhiia et al. disclosure, a description of a method of managing terahertz radiation, the method comprising: providing a semiconducting device having a two-dimensional carrier gas (in the QW channel, as Ryzhiia et al. explicitly discloses at the second column of page 1881) and comprising (note figure 1) a field effect transistor; exciting the carrier gas by shining a laser having an energy higher than 1.42 eV (the energy required to achieve a transition from bound states to continuum states, note the left column of page 1876) onto a bottom side of the semiconducting device; and adjusting a frequency of the radiation to a desired frequency using a gate bias voltage (the top of the right column of page 1876 states, "Due to the dependence of Σ on the bias voltages, the plasma resonances are voltage tunable") applied to the semiconducting device. Note figure 1 and pages 1875-1876 and 1881 of Ryzhiia et al. The difference between the prior art method disclosed by Ryzhiia et al. and the method of claims 1-3, 7, and 24 is that, where claims 1-3, 7, and 24 require a step of shining a laser pulse having a duration of approximately one femtosecond to ten picoseconds, Ryzhiia et al.'s method includes a step of shining two lasers with a difference frequency.

With regard to claim 8 the scope and content of the prior art includes, in the Ryzhiia et al. disclosure, a description of a method of generating radiation using a field effect transistor, the method comprising: shining a laser onto a gate (indicated in figure 1(b) as "Gate") of the field effect transistor; and adjusting a frequency of the radiation to a desired frequency by adjusting a gate length for the gate (note the bottom of the left column of page 1876, stating, "The resonant plasma frequencies are determined by the length of the QW channel (2*L*)") to adjust a carrier density of carriers in a channel of the field effect transistor. Note figure 1 and pages 1875-1876 of Ryzhiia et al. The difference between the prior art method disclosed by Ryzhiia et al. and the method of claim 8 is that, where claim 8 requires a step of shining a laser pulse, Ryzhiia et al.'s method includes a step of shining two lasers with a difference frequency.

With regard to claims 10 and 13 the scope and content of the prior art includes, in the Ryzhiia et al. disclosure, a description of a method of generating terahertz radiation comprising the steps of shining a laser onto a transparent gate (indicated in figure 1(b) as "Gate") of a field effect transistor; and adjusting a frequency of the radiation (note the bottom of the left column of page 1876 ["The resonant plasma frequencies are determined by the length of the QW channel (2*L*) and the electron sheet concentration in it (Σ)"] and the top of the right column ["Due to the dependence of Σ on the bias voltages,

the plasma resonances are voltage tunable"]) to a desired frequency by adjusting a carrier density of carriers (note, again, that Ryzhiia et al. teaches changing the sheet carrier density (Σ) by adjusting the bias voltages) in a channel of the field effect transistor. Note figure 1 and pages 1875-1876 of Ryzhiia et al. The difference between the prior art method disclosed by Ryzhiia et al. and the method of claims 10 and 13 is that, where claims 10 and 13 require a step of shining a laser pulse, Ryzhiia et al.'s method includes a step of shining two lasers with a difference frequency.

With regard to claims 14 and 29 the scope and content of the prior art includes, in the Ryzhiia et al. disclosure, a description of a method of generating radiation comprising shining a laser pulse onto a gate of a field effect transistor; and adjusting a frequency of the radiation to a desired frequency by adjusting a carrier density of carriers in a channel of the field effect transistor, wherein the laser pulse for a duration of approximately one femtosecond to ten picoseconds, wherein the shining excites plasma oscillations and wherein an active layer in the field effect transistor traps the plasma oscillations as plasma waves. The difference between the prior art method disclosed by Ryzhiia et al. and the method of claims 1-3 and 7 is that, where claims 1-3 and 7 require a step of shining a laser pulse having a duration of approximately one femtosecond to

ten picoseconds, Ryzhiia et al.'s method includes a step of shining two lasers with a difference frequency.

With regard to claims 15-17, 20, 25, and 26 the scope and content of the prior art includes, in the Ryzhiia et al. disclosure, a description of a method of generating terahertz radiation using a heterodimensional diode comprising the steps of shining a laser onto a bottom side of a substrate of a heterodimensional diode including an ohmic contact (side contacts shown in figures 1(a) and 1(b) and described in the left column of page 1876) and a rectifying contact (the Schottky collector described in the left column of page 1876); and adjusting a frequency of the radiation to a desired frequency using a voltage applied (the top of the right column of page 1876 states, "Due to the dependence of Σ on the bias voltages, the plasma resonances are voltage tunable") to the heterodimensional diode to adjust a frequency of a plasma wave in a two-dimensional carrier gas in the heterodimensional diode. Note figure 1 and pages 1875-1876 and 1881 of Ryzhiia et al. The difference between the prior art method disclosed by Ryzhiia et al. and the method of claims 1-3 and 7 is that, where claims 1-3 and 7 require a step of shining a laser pulse having a duration of approximately one femtosecond to ten picoseconds (as well as a second such pulse), Ryzhiia et al.'s method includes a step of shining two lasers with a difference frequency.

The difference between the prior art method disclosed by Ryzhiia et al. and the method of any of claims 1-3, 7, 8, 10, 13-17, 20, 24-26, and 29 is therefor that, where these claims require a step of shining a laser pulse (said pulse having a duration of approximately one femtosecond to ten picoseconds in claims 1-3, 7, 14, 24, and 29, and including multiple pulses in claims 15-17, 20, 25, and 26), Ryzhiia et al.'s method includes a step of shining two lasers with a difference frequency. Ryzhiia et al. does teach (note the first column of page 1875) that optical techniques using a coherent output at the difference frequency equal to the difference between the frequencies of radiation emitted by two lasers (as Ryzhiia et al. does) or a response of photoconductive structures to femtosecond optical pulses (as is claimed) are, in Ryzhiia et al.'s words, "Alternative approaches." Ryzhiia et al. supplies five separate references disclosing methods of generating THz radiation as a response of photoconductive structures to femtosecond optical pulses. Note the left column of page 1875. One of these is Sohn et al.

Sohn et al. discloses a method of generating radiation including a step of shining a series of laser pulses, each having a 110 femtosecond duration. Sohn et al.'s method produces a tunable THz source in the 0.5–3 THz region by the combined usage of femtosecond pulse shaping and photomixing. Note figures 2-3 and pages 13-14 of Sohn et al. The question is, taking into account the high level of education, skill, and creativity of

one of ordinary skill in the semiconductor art, would it have been obvious to achieve the invention of claims 1-3, 7, 8, 10, 13, 14, and 29 by substituting the step of shining a laser pulse having a 110 femtosecond duration taught by Sohn et al. for Ryzhiia et al.'s step of shining two lasers with a difference frequency?

To reject a claim based on the basis of the rationale expressed in section IIIB of the *Examination Guidelines*, Office personnel first must resolve the Graham factual inquiries (as has just been done). Office personnel must then articulate the following:

> (1) a finding that the prior art contained a device (method, product, etc.) which differed from the claimed device by the substitution of some components (step, element, etc.) with other components;
>
> (2) a finding that the substituted steps and their functions were known in the art;
>
> (3) a finding that one of ordinary skill in the art could have substituted one known element for another, and the results of the substitution would have been predictable; and
>
> (4) whatever additional findings based on the *Graham* factual inquiries may be necessary, in view of the facts of the case under consideration, to explain a conclusion of obviousness.

As explained above, Ryzhiia et al. discloses a method that differed from the claimed device only by the substitution of some steps (a step of shining a laser pulse having a 110 femtosecond duration) for other steps (a step of shining two lasers with a difference frequency). Sohn et al. discloses that the substituted steps and their functions were known in the art. Further, Sohn et al. discloses that those of skill in the art were familiar with a method combining the step of shining a laser pulse having a 110 femtosecond duration with a method (producing a tunable THz source in the 0.5–3 THz region by

photomixing) very similar to Ryzhiia et al.'s method. From the similarities between Sohn et al.'s method and Ryzhiia et al.'s method, one of skill in the art would have been able to conclude that the step of shining a laser pulse having a 110 femtosecond duration could have substituted for the step of shining two lasers with a difference frequency of Ryzhiia et al.'s method. One of skill in the art would have had reason to predict (based on its functioning in combination with Sohn et al.'s method) that the step of shining a laser pulse having a 110 femtosecond duration would have continued functioning much as it did in combination with Sohn et al.'s method, and that after the substitution, Ryzhiia et al.'s method would continue functioning in the manner disclosed by Ryzhiia et al. It would therefore have been obvious to a person having skill in the art to modify Ryzhiia et al.'s method by substituting the step of shining a laser pulse having a 110 femtosecond duration taught by Sohn et al. for Ryzhiia et al.'s step of shining two lasers with a difference frequency.

B. Claims 11, 21 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over RYZHIIA ET AL., "Terahertz photomixing in quantum well structures" J. App. Phys. Vol. 91 p. 1875 (2002), in view of SOHN ET AL., "Tunable terahertz generation using femtosecond pulse shaping," Appl. Phys. Lett. Vol. 81 p. 13 (2002), and PERALTA ET AL., "Terahertz photoconductivity and plasmon modes in double-quantum-well field-

effect transistors" Appl. Phys. Lett. Vol. 81 p. 1627 (2002) In the examiner's opinion, this/these claim(s) would have been obvious according to one of the rationales expressed in the *Examination Guidelines for Determining Obviousness Under 35 U.S.C. 103 in View of the Supreme Court Decision in KSR International Co. v. Teleflex Inc.*, as published at 72 Federal Register 57526 et seq. (10/10/2007).

The Guidelines explain that an invention that would have been obvious to a person of ordinary skill at the time of the invention is not patentable. The Guidelines point out that, as reiterated by the Supreme Court in KSR, the framework for the objective analysis for determining obviousness under 35 U.S.C. 103 is stated in *Graham v. John Deere Co.* Obviousness is a question of law based on underlying factual inquiries. The factual inquiries enunciated by the Court are as follows:

(1) Determining the scope and content of the prior art;
(2) Ascertaining the differences between the claimed invention and the prior art, and
(3) Resolving the level of ordinary skill in the pertinent art.

With regard to claims 11, 21 and 28, we begin by considering the first and second factual findings (the third finding concerning the level of skill in the art, is the same as before. The level of skill in the semiconductor art is a level of creativity, scientific thinking, and applied problem-solving unprecedented in the history of Man) required by *Graham*. The scope and content of the prior art includes, in the Ryzhiia et al. disclosure, a description of a method of managing terahertz radiation, the method comprising: provid-

ing a field effect transistor having a two-dimensional carrier gas and a transparent gate; exciting the carrier gas by shining a laser; and adjusting a frequency of the radiation to a desired frequency using a bias voltage applied to the transparent gate of the field effect transistor; wherein the bias voltage adjusts a carrier density of carriers in a channel of the field effect transistor. Note figure 1 and pages 1875-1876 and 1881 of Ryzhiia et al. The difference between the prior art method disclosed by Ryzhiia et al. and the method of claims 11, 21, and 28 is that:

1) where these claims require a step of shining a laser pulse, Ryzhiia et al.'s method includes a step of shining two lasers with a difference frequency. Ryzhiia et al. does teach (note the first column of page 1875) that optical techniques using a coherent output at the difference frequency equal to the difference between the frequencies of radiation emitted by two lasers (as Ryzhiia et al. does) or a response of photoconductive structures to femtosecond optical pulses (as is claimed) are, in Ryzhiia et al.'s words, "Alternative approaches." Ryzhiia et al. supplies five separate references disclosing methods of generating THz radiation as a response of photoconductive structures to femtosecond optical pulses. Note the left column of page 1875. One of these is Sohn et al.

2) where the claim requires the use of a periodic grating gate, Ryzhiia et al.'s method uses a transparent gate.

Sohn et al. discloses a method of generating radiation including a step of shining a series of laser pulses, each having a 110 femtosecond duration. Sohn et al.'s method produces a tunable THz source in the 0.5–3 THz region by the combined usage of femtosecond pulse shaping and photomixing. Note figures 2-3 and pages 13-14 of Sohn et al. Further, Peralta et al. discloses a method of producing voltage-tuned terahertz radiation with a grating-gated field-effect transistor. Note figure 1, the abstract, and the left column of page 1627 of Peralta et al. The question is, taking into account the high level of education, skill, and creativity of one of ordinary skill in the semiconductor art, would it have been obvious to achieve the invention of claims 1-3, 7, 8, 10, 13, 14,and 29 by substituting the step of shining a laser pulse having a 110 femtosecond duration taught by Sohn et al. for Ryzhiia et al.'s step of shining two lasers with a difference frequency, and to substitute Peralta et al.'s periodic grating gate for Ryzhiia et al.'s transparent gate?

To reject a claim based on the basis of the rationale expressed in section IIIB of the *Examination Guidelines*, Office personnel first must resolve the Graham factual inquiries (as has just been done). Office personnel must then articulate the following:

> (1) a finding that the prior art contained a device (method, product, etc.) which differed from the claimed device by the substitution of some components (step, element, etc.) with other components;
>
> (2) a finding that the substituted components and their functions were known in the art;
>
> (3) a finding that one of ordinary skill in the art could have substituted one known element for another, and the results of the substitution would have been predictable; and
>
> (4) whatever additional findings based on the *Graham* factual inquiries may be necessary, in view of the facts of the case under consideration, to explain a conclusion of obviousness.

As explained above, Ryzhiia et al. discloses a method that differed from the claimed device only by the substitution of some steps (a step of shining a laser pulse having a 110 femtosecond duration) for other steps (a step of shining two lasers with a difference frequency). Sohn et al. discloses that the substituted steps and their functions were known in the art. Further, Sohn et al. discloses that those of skill in the art were familiar with a method combining the step of shining a laser pulse having a 110 femtosecond duration with a method (producing a tunable THz source in the 0.5–3 THz region by photomixing) very similar to Ryzhiia et al.'s method. From the similarities between Sohn et al.'s method and Ryzhiia et al.'s method, one of skill in the art would have been able to conclude that the step of shining a laser pulse having a 110 femtosecond duration could have substituted for the step of shining two lasers with a difference frequency of Ryzhiia et al.'s method. One of skill in the art would have had reason to predict (based on its functioning in combination with Sohn et al.'s method) that the step of shining a laser pulse having a 110 femtosecond duration would have continued functioning much

as it did in combination with Sohn et al.'s method, and that after the substitution, Ryzhiia et al.'s method would continue functioning in the manner disclosed by Ryzhiia et al. It would therefore have been obvious to a person having skill in the art to modify Ryzhiia et al.'s method by substituting the step of shining a laser pulse having a 110 femtosecond duration taught by Sohn et al. for Ryzhiia et al.'s step of shining two lasers with a difference frequency.

Further, Ryzhiia et al. discloses a method of producing terahertz radiation with a voltage-tuned FET that differed from the FET used in the claimed method by the substitution of some components (a periodic grating gate) with other components (a transparent gate). Peralta et al. discloses that the substituted components and their functions were known in the art. Further, Peralta et al. discloses that those of skill in the art were familiar with a method of combining a periodic grating gate with a field-effect transistor similar to Ryzhiia et al.'s field-effect transistor. From the similarities between Peralta et al.'s field-effect transistor and Ryzhiia et al.'s field-effect transistor, one of skill in the art would have been able to conclude that the periodic grating gate could have substituted for the transparent gate of Ryzhiia et al.'s field-effect transistor. One of skill in the art would have had reason to predict (based on its functioning in combination with Peralta et al.'s field-effect transistor) that the periodic grating gate would have continued func-

tioning much as it did in combination with Peralta et al.'s field-effect transistor, and that when substituted, Ryzhiia et al.'s field-effect transistor would continue functioning in the manner disclosed by Ryzhiia et al. It would therefore have been obvious to a person having skill in the art to modify Ryzhiia et al.'s method by substituting the periodic grating gate taught by Peralta et al. for Ryzhiia et al.'s transparent gate.

C. The Guidelines point out that the both the Graham and KSR decisions require Office personnel to evaluate objective evidence relevant to the issue of obviousness. Such evidence, sometimes referred to as "secondary considerations," may include evidence of commercial success, long-felt but unsolved needs, failure of others, and unexpected results. The evidence may be included in the specification as filed, accompany the application on filing, or be provided in a timely manner at some other point during the prosecution. The weight to be given any objective evidence is decided on a case-by-case basis. The mere fact that an applicant has presented evidence does not mean that the evidence is dispositive of the issue of obviousness.

For evidence of unexpected results one must rely solely on evidence supplied by Applicants. Applicants have actually made the claimed combination. Evidence of differences between results of the actual functioning of the claimed combination and the results of the functioning one of skill in the art would have had reason to predict (i.e., the

"expected results") must necessarily come from one who has actually made the combination. A clear case of unexpected results would be if the claimed combination of prior art elements did not in fact perform according to their established functions in a predictable fashion; a result sometimes referred to as "synergy." See *Anderson's-Black Rock v. Pavement Co.* 396 U.S. 57, 61 (1969) (note that the *Anderson's-Black Rock* opinion does not actually employ the word "synergy"). However, the Guidelines make it clear that any type of unexpected results (and indeed any type of secondary considerations) must be considered.

Applicants' specification, however, does not include any evidence of secondary considerations. Applicants disclose that the claimed combination "may be" made; Applicants do not disclose any unexpected results or indeed any results at all.

Allowable Subject Matter

5. Claim 23 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Response to Arguments

6. Applicant's arguments with respect to claims 1-3, 7, 8, 10, 11, 13-17, 20, 21, 24-26, 28 and 29 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

7. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thomas L. Dickey whose telephone number is 571-272-1913. The examiner can normally be reached on Monday-Thursday 8-6.

If attempts to reach the examiner by telephone are unsuccessful, please contact the examiner's supervisor, Sue A. Purvis, at 571-272-1236. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Thomas L. Dickey/
Primary Examiner
Art Unit 2826